

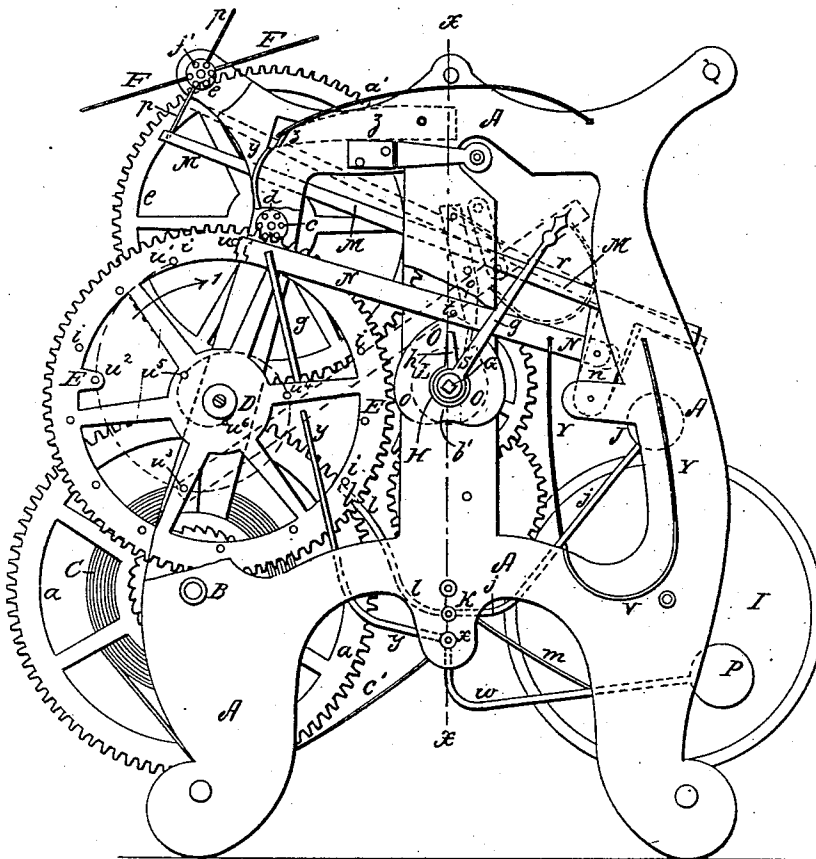
N. E. MULFORD.

Clock Striking Attachment.

No. 77,080.

Patented April 21, 1868.

Fig. 1.



Inventor:

Witnesses:
Theo Fische
Wm. Frewin

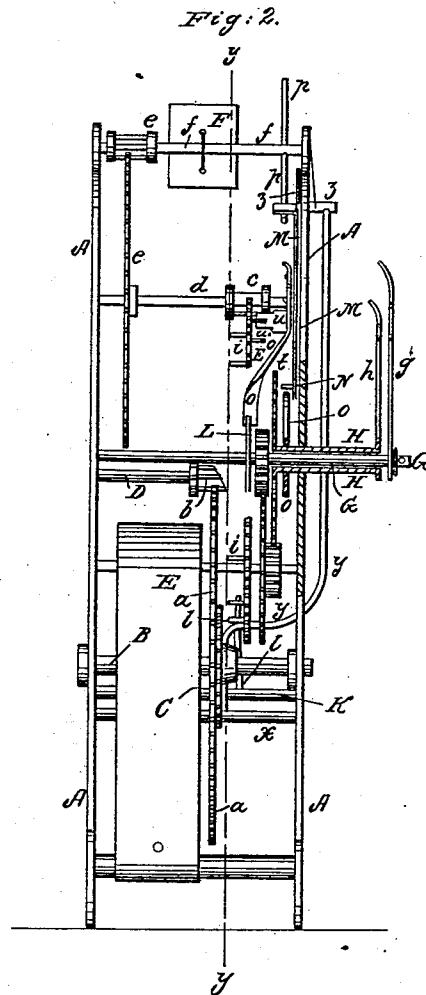
N. E. Mulford.
Per Munro & Co.
Attorneys.

N. E. MULFORD.
Clock Striking Attachment.

3 Sheets—Sheet 2.

No. 77,080.

Patented April 21, 1868.



Inventor:

Witnesses:
Thos Fische.
Wm Frewin.

N. E. Mulford.
Per Munroe & Co.
Attorneys.

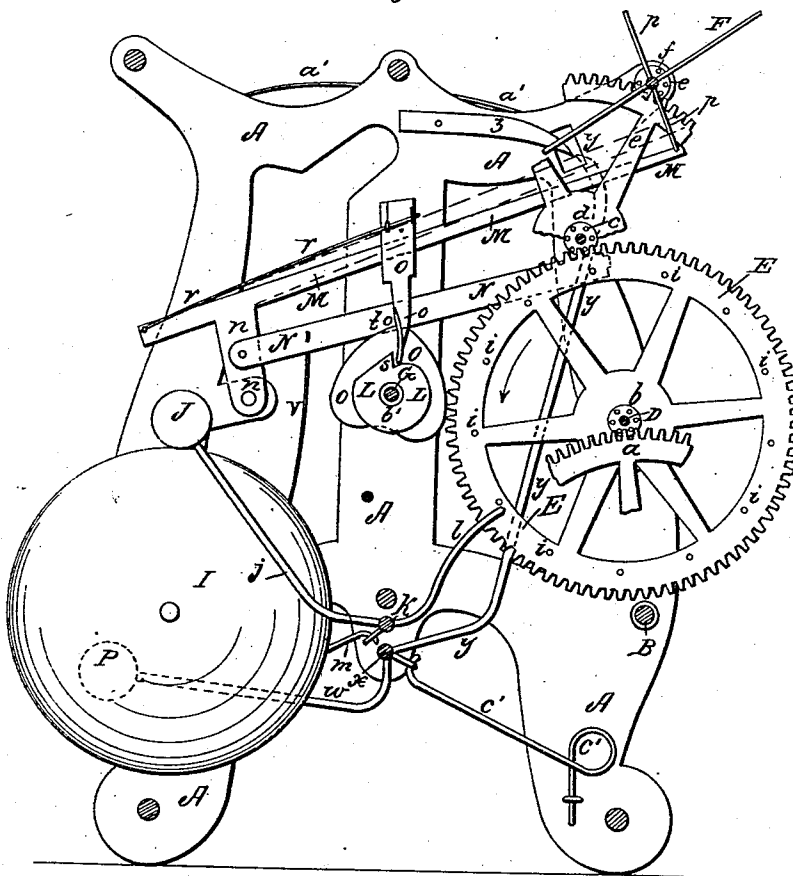
N. E. MULFORD.

Clock Striking Attachment.

No. 77,080.

Patented April 21, 1868

Fig. 3.



Witnesses:

Theo Fische.
Wm Frewin.

Inventor:

N. E. Mulford.
Per *[Signature]*
Attorneys.

United States Patent Office.

N. E. MULFORD, OF MADISON, NEW JERSEY.

Letters Patent No. 77,080, dated April 21, 1868.

IMPROVEMENT IN STRIKING-ATTACHMENTS TO CLOCKS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, N. E. MULFORD, of Madison, in the county of Morris, and State of New Jersey, have invented a new and improved Striking-Attachment to Clocks; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings forming part of this specification, in which—

Figure 1 represents a front elevation, partly in section, of my invention.

Figure 2 is a vertical transverse section of the same, the plane of section being indicated by the line *x*, fig. 1.

Figure 3 is a longitudinal vertical section of the same, the plane of section being indicated by the line *y y*, fig. 2.

Similar letters of reference indicate corresponding parts.

This invention relates to a new arrangement for operating the striking-part of a clock, and consists chiefly in the arrangement of a heart-shaped cam, mounted on the spindle of the hour-wheel, and in the arrangement of seven pins on the face of the hammer-wheel, said pins being arranged in a spiral line around the centre of the hammer-wheel. A lever, hinged at its opposite end, resting upon the heart-shaped cam, reaches with its free end towards the hammer-wheel, and as its end is being gradually raised or lowered by the rotation of the cam, its end is brought against the aforesaid pins, when the striking-part is set in motion to arrest the wheel, after a certain number of strokes have been made. As all the pins stand in different planes on the wheel, or, rather, at different distances from the centre of the same, and as the end of the lever is brought into a different plane during the motion of the cam in one hour, the correct adjustment of the pins is all that is required to make the device operate in the desired manner.

As the cam is mounted firmly on the same tube on which the hour-hand is fastened, it will be an impossibility for the work to be deranged if the shape of the cam and the positions of the pins are correct, and if the hands are not turned back.

The invention also consists in the arrangement of a half-hour striking-apparatus, which is set by the rod to which the regular striking-hammer is attached.

The invention further consists in the construction and arrangement of the devices for locking and releasing the regular and the half-hour-striking apparatus.

A represents the frame of an ordinary or suitable clock-work.

B represents the axle, which receives motion from the main-spring C, or from a weight or other device.

The axle B carries a large toothed wheel, *a*, which meshes into a pinion, *b*, on a horizontal axle, D. On the axle D is mounted a large toothed wheel, E, which meshes into a pinion, *c*, on an axle, *d*, from which, by similar gearing, *e*, motion is transmitted to an axle, *f*, carrying the fly F, as shown.

G represents the staff of the minute-hand, *g*, and H is the tube carrying the hour-hand, *h*. Motion is imparted to the staff G and tube H, in the usual or in a suitable manner.

Upon the inner face of the wheel E are secured thirteen pins, *i i*, arranged in a circle, concentric to the axle D, and equally far apart from each other.

I represents the striking-bell, and J the main hammer, secured to a rod, *j*, which projects from an oscillating-axle, *k*, as shown. An arm, *l*, projecting also from the axle *k*, fits under one of the pins *i*, as shown, and thus the connection between the hammer-wheel E and the bell is established. A spring, *m*, pressing upon an arm projecting from the axle *k*, has the tendency to throw the hammer against the bell unless the same is lifted by one of the pins *i*, as shown.

L is a cam, mounted on the staff G, as shown in fig. 3, so as to revolve with the same.

M is a lever, having an arm, *n*, near one end, the end of said arm being pivoted to the frame A, as shown in fig. 3. A bar, O, is pivoted to the lever M above the shaft G, and rests with its end on the edge of the cam L, a spring, *r*, drawing it into proper position.

The extreme end of the lever M is bent, as shown in fig. 2, so as to catch a rod or stop, *p*, projecting from the fly-shaft *f*, as shown. Thus the lever M, and the stop or stops *p*, form the detents for preventing the striking-apparatus from moving.

In the edge of the cam is formed a sudden depression, *s*, which is at all times in line with the minute-hand *g*, and which, when the minute-hand points at 12, causes the bar *o* to fall upon the lower part of the edge, thereby lowering the end of the lever M, and releasing the stops *p*, allowing the fly to revolve, and thus setting the whole striking-apparatus in motion.

To the arm *n*, which projects from the lever M, is pivoted the end of the lever N. This lever has a pin, *t*, which rests upon the edge of a heart-shaped cam O, mounted on the tube H, as shown.

A spring, *v*, may be used to force the lever N down upon the cam O if its own weight is not sufficient for the purpose. To the front face of the wheel E are fixed seven pins, *u*¹, *u*², *u*³, *u*⁴, *u*⁵, *u*⁶, and *u*⁷, respectively. These pins are arranged in a spiral line around the axis of the wheel E, as is indicated in fig. 1, so that they are all different, far from the axle D.

The end of the lever N, when the movement is at rest, lies with its free end against one of the pins *u*, and when the apparatus is set in motion, it is raised or lowered by the heart-shaped cam O, so as to stand opposite to the pin by which the motion is to be arrested.

In the small angle described between the pins *u* and *u*¹ is one pin *z*, and in its supplement are twelve pins, *z*'. Thus, when the end of the lever N arrests the wheel E by means of the pin *u*, as in fig. 1, and the wheel is then again set in motion, it will be again arrested by means of the pin *u*¹, and as the wheel turns in the direction of the arrow 1 in fig. 1, the short distance between *u* and *u*¹ will be traversed by the pin, when *u*¹ will strike the end of N, and as but one pin, *z*, is in this space, the hammer will be raised but once by a pin, *z*, and consequently the hour-hand stands at 1. When the lever N rests upon the depression in the heart-shaped cam O, its end will be in its lowest position, and will strike against the innermost pin *u*⁶ when the hour-hand stands at 6; thence the lever N will be gradually raised, and will detain the wheel by means of the pins *u*⁵, *u*⁴, *u*³, *u*², *u*¹, and *u*, respectively, as the arm *o* drops into the depression of the cam L once during every revolution of the staff G.

When the bar is being raised, and arrives at the pin *u*⁶, the wheel E will have moved in an arc in which seven pins, *z*, are arranged, and thus it will strike 7; when at *u*⁵, the strokes of the hammer will be 8; when at *u*⁴, 9; at *u*³, 10; at *u*², 11; and at *u*, 12.

When at 12, the lever N is on the most elevated part of the heart, and as the tube H continues to revolve, it is being gradually lowered, so as to come again to the pin *u*¹, when it will strike 1, and as it continues to be lowered, it will arrive at the pin *u*², when it will strike 2; at *u*³, 3; at *u*⁴, 4; at *u*⁵, 5; and at *u*⁶, 6.

It will be seen that, therefore, each pin, except *u* and *u*⁶, gives a different amount of strokes when the lever N is being raised, or when it is being lowered. This is easily explained and understood. When, for example, the lever is lowered from the pin *u*, it comes against *u*¹, and it strikes 1, as above described; when the lever is raised from the pin *u*² it arrives also at *u*¹, but to do this the wheel E must turn in a curve, in which eleven pins, *z*, are arranged, and thus it will strike 11.

As soon as the fly F is released, the clock begins to strike, and the striking-apparatus is stopped when one of the seven pins *u* strikes against the end of the lever N. But as soon as the shaft G continues to turn, the arm *o* is soon raised on the cam L sufficient to allow the lever M to catch the stop *p*. As the lever N is pivoted to the arm *n* of the lever M, it is evident that, as the lever M is being raised, the lever N will be slightly drawn back, and will therefore be released from the pin *u*, against which its end was held, so that it can be freely raised or lowered again by the heart O. It will thus be seen that the lever N detains the motion momentarily, but that the lever M soon takes its place as detent-lever, and that therefore the lever N is free to move after having fulfilled its office by stopping one of the pins *u*. All these results could not be obtained if the levers M, N, and *o* were not jointed together, as shown, so that each will be affected by the motion of the other.

The lever N is represented as working above the axle D. It may also work below the same, in which case it will have to be provided with a hook at its end, to detain the pins *u*, as indicated by blue lines in fig. 1. In that case, the connections between the levers M, N, and *o* may be slightly varied, but will remain the same in fact. The arm *o* may, for example, be made oscillating, so as not to be raised, but moved aside by the cam L. In that case, also, will the lever M be firmly secured to the pivoting-pin of the lever *o*, while the lever N is pivoted to an arm projecting from the pivoting-pin.

I am aware that attempts have been made at the introduction of spirally-arranged pins on the hammer-wheel E, but in all such cases no true spiral line was used, as a new start had to be taken from 12 to 1, the same set of pins being not used to strike the lever N as it was moved upward and downward; some pins may have been used twice, but not all, between the six and twelve pins, as in my clock.

The apparatus may also be connected with a half-hour-striking device. The same consists of a hammer, P, secured to a rod, *w*, which turns with its pivot-pin *x*. From the pin *x* extends upward an arm or rod, *y*, which catches over the hook-shaped end of a bar, *z*, that is pivoted to the upper part of the frame A, as shown. A spring, *a*', tends to depress the bar *z*, so that it rests upon the lower edge of a slot or recess in the frame, as shown. It will be noticed that when the lever M is raised out of the recess *s* of the cam L, it will be just under the lower edge of the bar *z*, as shown by red lines in fig. 3. Opposite to the recess *s* is, on the cam L, an elevated portion, *b*', which is vertically above the axle G when the minute-hand points at 6.

By this elevated portion *b*' the arm *o* is raised higher than usual, and thereby also the lever M is raised, elevating the bar *z*, so that the same will release the arm *y*, thus releasing the hammer P, which will, by a spring, *a*', be forced against the bell, indicating that the minute-hand points at 6.

The rod *y* is bent, so as to have a horizontal portion, as shown in fig. 2. This horizontal portion is under the arm *l* of the hammer *J*, and when the hammer *P* has struck, the horizontal part of *y* will rest against the arm *l*.

As soon as the minute-hand points at 12, the striking-apparatus will be set in motion, and as the pin *i* carries the arm *l* back to raise the hammer *J*, the arm *l* will carry the rod *y* back far enough to allow its end to catch under the end of the spring-catch *z*.

Thus the half-hour-striking attachment is set, or, it may be said, wound up, by the motion of the main striking-hammer *J*. It may also as well be set by the direct action of the wheel *E*, or by another portion of the main striking-apparatus, with the same effect. When the hands are turned backward, the shoulder *s*, on the cam *L*, carries the arm *o* to one side, and the spring *r* draws the latter into its proper position after its end is released from the shoulder *s*. Thus the hands may be turned backward without injury to the internal arrangement or parts.

This movement could not be accomplished if the lever *M* could not move up and down. To facilitate this backward motion of the hands, the cam *L* should or may be provided with a flattened portion, near the recess *s*, as shown, to allow the end of the bar *o* to be drawn back by the spring *r*. By such backward motion of the arm *o*, the lever *M* is raised to lock the fly.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement of the seven detent-pins, *u*, *u'*, *u''*, &c., on the face of the hammer-wheel *E*, the said pins being set in a spiral line, as described, and at such distances apart that the required number of pins *i* will be between every two adjacent pins *u*, substantially as and for the purpose herein shown and described.
2. The heart-shaped cam *O*, when mounted on or connected by gear or otherwise with the tube *H*, to which the hour-hand is fastened, and when combined with a lever, *N*, which is gradually raised or lowered by the rotation of the cam, so that its end will be brought into a different plane, substantially as and for the purpose herein shown and described.
3. The lever *N*, when arranged substantially as herein shown and described, in combination with the heart-shaped cam *O*, turning with the tube *H*, and with the seven pins *u*, *u'*, &c., arranged spirally on the face of the wheel *E*, which carries the thirteen pins *i*, substantially as herein shown and described.
4. The lever *M*, when connected with the bar *o*, and when raised and lowered by means of the cam *L*, in combination with the stops *p* on the fly *F*, all made and operating substantially as herein shown and described.
5. Connecting the detent-lever *N* with the retaining-lever *M*, and with the releasing-lever *o*, substantially as and for the purpose set forth.
6. The arrangement and combination with each other of the heart-shaped cam *O*, lever *N*, wheel *E*, having the seven pins *u*, *u'*, &c., cam *L*, levers *o* and *M*, and stops *p* on fly *F*, all made and operating substantially as herein shown and described.
7. The half-hour-striking apparatus, when consisting of the hammer *P*, rods *w* and *y*, the latter being held by means of a spring-catch, *z*, substantially as herein shown and described.
8. Connecting the lever *M* with the catch *z* of the half-hour-striking apparatus, so as to release the same, substantially as herein shown and described.
9. The arrangement herein shown and described, of setting the half-hour-striking apparatus, by means of the arm *l* of the main hammer, which catches the rod *y* of the half-hour hammer, locking it with its catch *z*, when the main striking-device is in operation.
10. The cam *L*, when mounted on the staff *G*, as herein shown and described, and when provided with a recess, *s*, and with an elevation, *b'*, opposite to the same, substantially as and for the purpose herein specified.
11. Pivoting the arm *o* to the lever *M*, and combining it with the spring *r*, for the purpose of allowing the hands to be turned backward, substantially as herein shown and described.
12. Setting the half-hour-striking apparatus by means of the main striking-apparatus, when the same is in motion, substantially as set forth.

Witnesses:

WM. F. McNAMARA,
ALEX. F. ROBERTS.

N. E. MULFORD.